9/25/2002

Preliminary Restoration Plan

Harper Estuary, Kitsap County, WA
Section 206

1. Project Information

Name of Project: Harper Estuary
Congressional District: WA-06

2. Project Location

The project area is located in Harper estuary on the southeast shoreline of Kitsap County, approximately 5.5 miles east of Port Orchard, Washington (**Figure 1**). The estuary drains several small streams, including Harper Creek, into the Puget Sound (**Figure 2**).

3. Project Description

Current Conditions

Several activities have lead to the degradation of the Harper estuary, including road construction through the estuary, inadequate tidal exchange through the road culvert, inappropriate disposal of bricks from a historic manufacturing operation and construction of a makeshift boat ramp by filling part of the estuary.

During the early 1900s, the western side of the estuary was accessed across a wooden drawbridge. The bridge also allowed barge traffic to pass up a maintained channel, into the mouth of the estuary, to the loading area for the Harper Brick & Tile Co. The brick company manufacturing plant and clay mining operations were located southwest of the estuary. The remnants of clay mining and brick operation, including cut hillslopes, relic mining pits, and the unused bricks, named "clinkers", are evident in the estuary area and the adjacent hills.

Eventually the wooden drawbridge was abandoned and razed, and road embankments were constructed through the estuary. At one time, a road was aligned along the northeastern edge of the estuary across a sand spit. The road embankment is now abandoned and the former estuary areas between the road embankment and SE Olympiad Dr. have transformed into an isolated freshwater marsh. A bulkhead currently lines the northern shore of the freshwater marsh. A second road, SE Olympiad Dr., was constructed and bisects the estuary across its historic mouth. The culvert under SE Olympiad Dr. is currently undersized and limits the amount of water, sediment and decayed organic material (detritus) exchanged between the estuary and the Sound (**Figure 3**). SE Olympiad Dr. provides redundant access across the estuary between Southworth Dr. and a local neighborhood. Additional losses in historic estuary area have been incurred through the construction of a makeshift boat ramp and conversion of vegetation or filling in of the areas now occupied by the Little League ballpark. The ballpark was most likely filled in during the period of brick manufacturing operations.

Harper Creek enters the estuary from the southwest side and its course has been channelized through the upper estuary. This was apparently an effort to drain the upper estuary for agricultural use. An old fenceline parallels the course of the stream channel. The result has been loss of the historic channel migration zone.

Historic Description

Historically, the Harper estuary had more area inundated by tides, which has been reduced by filling from road construction and historic manufacturing activities. The mouth of the estuary would have extended across the area between the sand spit and the western shoreline, which is now under Southworth Road. Flows would have accessed the estuary through a tidal drainage channel(s). There were multiple freshwater drainage channels that likely connected to a primary tidal drainage channel that had eelgrass and other saltwater marsh vegetation in areas that were inundated by the high tides.

The estuary historically exchanged a larger volume of water, sediment and detritus between the estuary and the Sound. The mouth of the estuary was much wider and allowed more flow to pass in and out of the estuary, without the choking effect of the culvert. More water in the estuary during high tide provided additional areas of habitat for migrating juvenile salmonids. In addition, the estuary had a greater ability to flush sediments and organic material into the Sound. The flushing of detritus is an important component of estuary habitat function. Organic carbon derived from decaying plants serves as the basis of the estuarine food web. Detritus provides food for organisms like epibenthic crustaceans, which are preyed upon by juvenile salmonids. Salt marsh vegetation would have provided cover for young salmon using the estuary to adjust to marine waters after their migration from freshwater rearing areas. Therefore, the estuary historically had higher habitat benefits to juvenile salmonids by providing foraging, cover and protective areas during high tide, and contributed more detritus to the Sound through system flushing.

Project Objectives

The overall project objectives are to reclaim historic estuarine areas, improve tidal hydrology, remove fish passage barriers, reduce sediment scour and deposition problems, as well as reduce the fragmentation of shoreline / upstream habitats and environments. The restoration activities will ultimately increase the estuary, shoreline, and habitat areas used by chinook salmon, which is listed as a threatened species under the Endangered Species Act, a variety of other salmon species, as well as sea-run cutthroat and steelhead trout. Additionally, restoration activities will rejuvenate the natural processes of tidal and sediment exchange essential for maintaining quality estuarine habitats. Finally, restoration project goals align well with the regional restoration goals of reducing watershed/estuary/shoreline fragmentation, which has contributed to the significant decline of the Puget Sound chinook salmon population.

Preliminary Restoration Plan

The recommended Preliminary Restoration Plan includes several proposed actions that are designed to satisfy the project objectives (Figure 2). The plan is subject to change during the Planning, Design and Analysis phase (PDA), which will assess additional potential restoration

alternatives and evaluate all proposed alternatives to ensure that the project objectives are met in the most cost-effective manner.

The first recommended action is to replace the SE Olympiad Rd. culvert with a 60-foot concrete span bridge, which will improve the tidal prism and exchange across the estuary inlet and improve sediment and detritus transport.

The second proposed action is the removal of the makeshift boat ramp from the estuary mouth. Currently, the boat ramp occupies approximately ¼ of an acre of historic estuarine area. The goal is to regain estuarine habitat, and improve the natural tidal, sediment and detritus exchange across the mouth of the estuary.

The third proposed action is to remove (breach) a section of the historic road embankment that resides on the historic sand spit. The goal of breaching the historic road embankment is to allow tidal flows access to the one-acre freshwater marsh, and allow it to regain its saltwater estuary characteristics.

Additional components of the recommended plan include; brick removal, bulkhead removal, dredging / excavation and regrading tidal drainage channels, mudflats and freshwater marsh areas, remove freshwater marsh species and replant with saltwater marsh vegetation.

Project Alternatives

Additional alternatives considered for the Harper estuary restoration include:

A. Using wide span arch or box culverts instead of the bridge design
B. Complete removal of SE Olympiad Dr. through the estuary
C. Redesigning the makeshift boat ramp, offset improvements for boat ramp alternatives at other locations
D. Removal of the historic road embankment and sand spit restoration, and
E. Development of educational / recreational facilities and trails.

An incremental analysis will evaluate the benefits of the restoration alternatives. The analysis would examine the techniques recommended for restoring the freshwater marsh area, behind the historic road embankment, into a saltwater environment. During PDA, hydrologic modeling could be used to identify a breach width that would maximize tidal inundation while minimizing costs. Important parameters such as velocities at the breach (a consideration for fish passage) and the frequency, depth, and duration of tidal inundation (a factor which will determine the success of salt marsh establishment) will drive the modeling effort.

Without Project Conditions

Historically, Harper Estuary had approximately double the current acreage of estuarine habitat. Approximately three to five acres have been lost to road construction and filling for the brick manufacturing and ballfield facilities. The upper estuary is currently transforming from a predominately saltwater marsh into a combination of saltwater/freshwater emergent marsh. The loss of saltwater habitat due to the encroachment of freshwater vegetation is a direct result of the reduction of tidal flows through the SE Olympiad Dr. culvert into the upper estuary. Habitat

conditions will remain in a degraded state and may continue to shift away from the saltwater environment to a freshwater emergent marsh system.

Physical and biological habitat function within the estuary will remain degraded without restoration. Shoreline habitat will continue to remain fragmented due to the reduction in nearshore habitat functions. Furthermore, the sediment exchange between the estuary and Puget Sound will be limited and the morphological characteristics of the estuary will be driven by the current hydrologic regime controlled by the choking effect of the undersized culvert. The natural processes including tidal and sediment exchange will remain diminished due to the inadequate culvert size.

With Project Conditions

The proposed restoration activities will reclaim lost estuarine areas, restore natural hydrologic processes and contribute to reconnecting fragmented shoreline habitat and upper watershed areas on the East Kitsap Peninsula. Reclaiming the historic estuarine areas will increase habitat areas and promote habitat functions that were negatively affected by anthropogenic influences that have caused shifts in natural processes. Restoration of ecological functions will improve baseline conditions for invertebrates (epibenthic crustaceans), fisheries (salmon and trout), and birds (shore and migratory) that are part of the estuary environment. The increase in habitat areas will provide more area for juvenile salmonids to forage and rest, as well as provide protective cover during their migration towards the Pacific Ocean. Additional benefits include increased export of decayed organic materials that are the base of the food web, which will promote the productivity of prey organisms in adjacent nearshore areas.

The proposed actions would not only benefit salmon from the Harper Creek watershed. Recent surveys of nearshore marine habitat at a Navy facility near the project site indicate that this area is utilized by chinook salmon from as far away as the Nisqually River, approximately 40 miles to the south (Weitkamp 1994). Restoring estuary habitat in this area will benefit salmon from a number of southern Puget Sound rivers. Improving foraging habitat would allow these salmon to gain more weight during their migration to the ocean, which will improve their chances for survival once at sea.

Specific improvements in estuary habitat areas include the increase in usable habitat resulting from the additional areas of saltwater inundation by increasing tidal flux into the estuary. By installing span-arch culverts or pier span bridges, reductions in localized scouring and sediment deposition problems are anticipated. In addition to reducing localized hydraulics, increases in tidal exchange across the culverts and bridges will occur and create higher quality habitat conditions by reestablishing historic processes and estuary function. Morphologically, the upper estuary has experienced shifts in channel configuration due to the reduction of tidal and sediment exchange and channelization of Harper Creek. The restoration designs will promote the establishment of a natural system of dendritic drainage channels, allow normal migration of the stream course and open the estuary mouth.

Project Importance

The project is an important restoration "piece" in the large-scale picture of Puget Sound environmental restoration goals. It is well aligned with the regional goals of salmon species protection and habitat restoration in the Puget Sound. Harper Estuary is listed as a potential restoration site in the Washington State Conservation Commision, Salmonid Habitat Limiting Factors, WRIA 15, Final Report (Harring, 2000). Generally, the estuary provides foraging, cover and rearing habitat for salmon juveniles as they migrate out of the Puget Sound to the Pacific Ocean. The National Marine Fisheries Service has designated this area as critical habitat for Puget Sound chinook salmon. Although the project footprint only involves areas in and around Harper estuary, it will contribute to the quiltwork of restoration projects throughout the Sound. Improving detritus transport out of the estuary will also contribute to increased productivity in adjacent marine waters. More importantly, the restored estuarine areas can potentially contribute to restoring habitat areas for Chinook salmon, which has been listed as a threatened species under the Endangered Species Act.

Harper estuary is considered a "quality" habitat area and in fairly good condition. The importance of this project is that the restoration of the historic estuary functions and processes will contribute to regional level restoration goals of the Puget Sound. Estuarine habitats throughout the Sound are in poor condition, and efforts are needed to protect and improve these habitat areas. This project is an excellent opportunity to reinvigorate historic estuary habitat function at a relatively low cost.

Environmental Outputs

The restoration project will promote a more historic hydrologic regime needed by the remaining salt marsh, restore approximately one acre of historic estuarine areas that have been filled, and promote natural habitat processes and functions. The primary result of these changes will be improved primary and secondary production at the site, which will create better foraging and refuge habitat for juvenile salmonids. The benefits of the restoration actions can be measured in a number of ways—everything from a simple calculation of acreage restored to a more complex model of the biomass of salmon prey produced per square meter of habitat restored (after Healey 1982). Evaluation of the environmental outputs will use an incremental analysis approach that will quantify the effectiveness an individual restoration alternative has with respect to other alternatives and contribution to overall restoration goals. Please see Table 1. for a conceptual evaluation framework and estimated outputs.

Table 1. Environmental Output Table for Incremental Analysis

Output	Alt. 1 No Action	Alt. 2 One 60-foot Bridge Span	Alt. 3 Remove Road Embankment
Area inundated	1 acres	2 acres	5 acres
Tidal prism		increase above existing conditions	increase above existing conditions
Velocity at culverts	may not meet state fish passage criteria	meets state fish passage criteria	meets state fish passage criteria
Salt marsh size	1 acre	2-4 acres	4-8 acres
Freshwater wetland size	5 acres	1 acre	5 acres
Net primary productivity		increase above existing conditions	increase above existing conditions
Net secondary productivity		increase above existing conditions	increase above existing conditions
Water quality (temperature/DO)	inadequate flushing-may not meet state standards	improved flushing-more likely to meet state standards	improved flushing-more likely to meet state standards

Please note that these output estimates are preliminary, and will be refined during PDA. Those outputs measures qualitatively here will be expressed quantitatively after PED.

Planning, Design and Analysis Study Methods

During the next phase (PDA) studies will characterize baseline habitat conditions and identify the potential improvements to these conditions from the proposed restoration actions. Proposed restoration features will be analyzed using standard modeling techniques to determine if there are potential adverse effects from restoration activities. Preliminary costs and habitat outputs will be utilized to conduct an incremental cost and cost effectiveness analysis of the proposed project alternatives. The preferred restoration alternative will be chosen based upon the incremental analysis approach. A monitoring plan will be developed during the PDA phase to assist in modeling efforts and measure the effects of future restoration efforts.

It is important to adequately assess baseline conditions, which will provide information needed to estimate environmental outputs and use the information to further develop restoration alternatives and designs. The PDA study will provide information on several parameters that will help quantify and characterize estuary conditions. A few of these parameters include water quantity (tidal exchange), estuary acreage, water quality, sedimentation and geomorphic

characteristics, vegetative composition, fish barriers, areas of aquatic and canopy cover, and refuge, macroinvertebrate and fish population surveys.

LERRD

The Non-Federal Sponsor (NFS) for this project is Kitsap County, Washington. The project footprint covers approximately 16.5 acres. The proposed project affects 15 parcels with 14 owners. The NFS currently owns 1 acre and is in the process of acquiring 2.7 acres from the Washington State Parks Commission. An additional 9.7 acres is under the control of the Washington State Department of Natural Resources (DNR), and 3.1 acres are in private ownership.

All lands within the proposed project footprint have been identified by the NFS as wetlands or wetland buffer areas, which are regulated under the Kitsap County Critical Areas Ordinance. Without a variance to the restrictive ordinance, the law prohibits all development within the project area. The preliminary estimate of land value is based on the assumption that development within the proposed project footprint is precluded by law, and that such land has no mitigation value tied to any future offsite development.

Lands in the proposed project area that are under DNR control are defined by Washington state law as *Second Class Tidelands and/or Second Class Shorelands* (RCW 79.90.050 and RCW 79.90.050, respectively). DNR may, with the advice and approval of the state board of natural resources, sell such lands at fair market value to any municipal corporation or agency of the state of Washington when said lands are to be used solely for municipal or state purposes (RCW 79.94.160). Preliminary land values have been estimated based on the assumption that conveyance of a fee estate is both legally permissible and generally required by the Corps for environmental restoration projects. The actual fair market value estimate of lands necessary for the project will be determined based on an appraisal of such lands performed by the NFS in a later project phase.

The need for an off-site disposal area is not anticipated. Construction staging will occur within the project footprint, or within a temporary work area easement that may be required for replacing culverts under SE Olympiad Drive, which bisects the project area from east to west. A reasonable detour route to allow access around the project area is available on a public road (SE Southworth Drive) in the event SE Olympiad Drive must be closed during construction.

A 25% contingency amount has been proposed to allow for the relative uncertainty of land values and the probability of protracted negotiations with DNR regarding acquisition of necessary real estate interests under their control within the project area.

NFS will need to acquire and certify all LER available before advertising for construction.

The estimated value for the LER is as follows:

16.5 acres fee		$ 9,000
NFS Acquisition & Cost Incidentals	+	$ 93,000
		$102,000

Contingency (25%)	+	$ 26,000
	Sub-total	$128,000
Federal Review and Assistance Costs		$ 22,000
Contingency (25%)		$ 6,000
	Sub-total	$ 28,000
	Total	**$156,000**

4. Consistency Statement (Section 206)
Not required for Section 206.

5. Views of the Sponsor
A letter requesting the Section 206 study from Kitsap County is attached. Kitsap County is the local government agency sponsoring the project and will assume full responsibility for all future project related operation, maintenance, rehabilitation and replacement needs. Coordination and cooperation with other local government landowners and private landowners are required for the successful completion of the project. Generally, the local community is in support of the Harper Estuary Restoration Project (**Figure 4**). Letters of support from the local community are also attached to this document.

6. Views of Federal, State, and Regional Agencies
Federal agencies with an interest in the project include the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, who will have consultation, permitting and scheduling requirements, but generally approve of estuary restoration activities. The proposed project is consistent with their recovery goals for area salmonids protected under the Endangered Species Act. A state representative from the Washington Department of Fish and Wildlife (WDFW) was present during a group field visit and is supportive of the proposed restoration project. The Suquamish Tribe also was represented and expressed support for the estuary restoration project and offered to coordinate and assist with fish monitoring services.

Letters of support for the project have been received from WDFW, the Suquamish Tribe, Kitsap Conservation District, local citizens and landowners located in the project footprint area.

7. Environmental Compliance Requirements
The project will be compliant with all applicable regulatory requirements. An Environmental Assessment, 404 (b)(1) analysis, water quality certification, Coastal Zone consistency determination, Cultural Resource Assessment, and Biological Assessment (BA) will be needed to complete the project. The majority of coordination and permits will be completed during the Planning and Design phase. All environmental compliance will be completed prior to commitment of construction funds. The project sponsor is also expected to acquire the following environmental coordination: 1) Clear and Grade Permit (County); 2) Hydraulics Project Approval (WDFW); and 3) Shoreline Permit (County).

8. Costs and Benefits

The total estimated project cost is $1,213,000 including LERRD. Costs were estimated for the construction of the SE Olympiad Dr. culvert removal and replacement with a 60-foot span concrete bridge, breaching the historic road embankment, boat ramp removal, brick and bulkhead removal, Southworth Dr. culvert replacement and upstream watershed restoration. The PDA study will refine project costs based upon the preferred restoration alternatives. Estimates of potential project costs have been developed and are included in Section 11.

The planning and design report will address monitoring, O&M requirements and associated costs. Operation and maintenance requirements after project construction are expected to be minimal. Debris removal is the most likely candidate for routine maintenance. However, it is anticipated that less debris will clog the larger span culverts and bridges.

Benefits from the project are related to the recovery of endangered salmon species. The estuary restoration will provide additional areas of essential habitat to juvenile salmonid migrants and increase habitat function. Benefits are ultimately related to the area of recovery and future use of the restored environment.

9. Project Schedule

Depending upon agency and community coordination, and the ability to secure project funding, construction could begin as soon as the summer of 2004. The schedule below was developed assuming that funding was not an issue and that the project proceeded to the PDA phase immediately.

Planning, Design and Analysis Phase	April 2002 – June 2004
Construction	July 2004 - August 2004

10. Supplemental Information

The Harper estuary site will have a monitoring plan as part of the project. Both baseline conditions and project effects will be monitored and evaluated for the restoration project. Monitoring costs are not known at this time but will include items such as cross section surveys, vegetation and fishery surveys and general site characterization. Site monitoring is one option of in-kind services Kitsap County could provide for the project. In addition, the Suquamish Tribe has offered to assist with fish monitoring. Harper estuary has been used as a reference site for the construction of the schel-chelb estuary on Bainbridge Island. As a result, the Washington Department of Transportation has established vegetation monitoring plots at Harper.

11. Financial Data

a. Table 2. identifies the preliminary estimate of the project cost burden and schedule for Kitsap County and the Corps.

Table 2. Preliminary Financial Requirements

PHASE	TOTAL	FEDERAL	NON-FEDERAL	FY 02	FY 03	FY04
PDA	$235,000	$235,000	*	$100,000	$100,000	$35,000
Construction	$978,000	$553,000	$425,000	-	-	$553,000
TOTALS	$1,213,000	$788,000	$425,000	$100,000	$100,000	$588,000

* Note: Planning, design and analysis study phase is initially Federally funded, and then at time of signing Project Cooperation Agreement (PCA), the costs are retroactively cost-shared by the sponsor.

b. Non-Federal Requirements

LERRD	$128,000
Cash	$272,000
In-Kind Services*	$25,000
Annual OMRR&R	$10,000

*In-kind services performed after the PCA is signed are credited against the cash portion of the project. Examples of in-kind services include: revegetation of project area, using Kitsap County trucks to haul excavated materials etc…

c. Fully Funded Cost Estimate.
The fully funded cost as found in the PCA is estimated to be $1,213,000.

12. Federal Allocations to Date: None to date.

References

Haring, D., 2000, Salmon and Steelhead Habitat Limiting Factors Water Resource Inventory, Area 15, Washington State Conservation Commission.

Healey, M.C. 1982. "Juvenile Pacific Salmon in Estuaries: The Life Support System." In *Estuarine Comparisons*, edited by V.S. Kennedy, Academic Press, 1982.

Weitkamp, L.A. 1994. *Environmental Monitoring of the Manchester Naval Fuel Pier Replacement, Puget Sound, Washington*. Coastal Zone and Estuarine Studies Division, National Marine Fisheries Service, Seattle, WA

USACE, 2000, ER-1105-2-100, Appendix F – Continuing Authorities

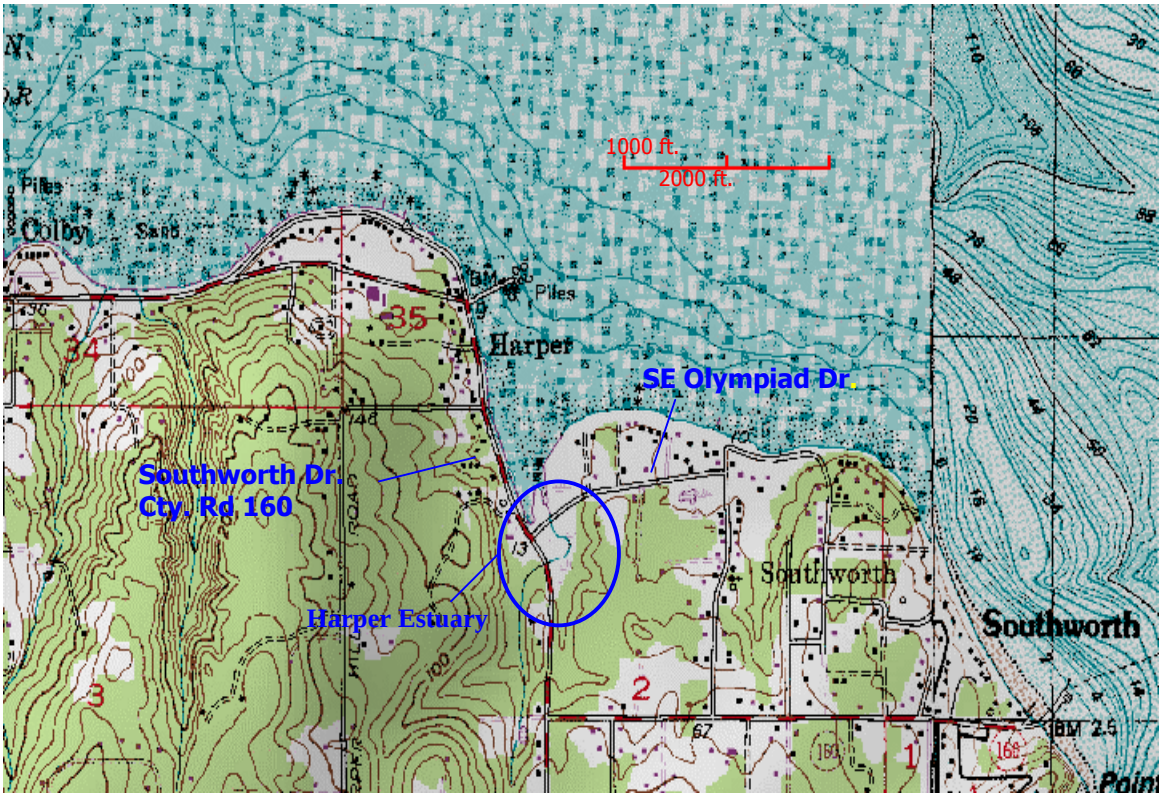

Figure 1. Harper Estuary Site Map

Figure 2. Harper Estuary Proposed Restoration Areas

Figure 3. Harper Estuary – SE Olymiad Dr. Culvert

Figure 4. Harper Estuary, Upstream from Culvert with Community Advocate